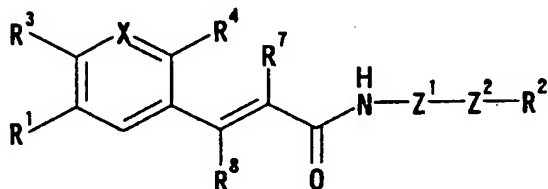


CLAIMS

1. A compound represented by the formula:



wherein R¹ is a 5- or 6-membered ring which may be substituted;

- 5 R³ is a hydrogen atom, a lower alkyl group which may be substituted or a lower alkoxy group which may be substituted;

R⁷ and R⁸ are each a hydrogen atom or a lower alkyl group which may be substituted;

- 10 Z¹ is a 5- or 6-membered aromatic ring which may be further substituted;

Z² is a group represented by -Z^{2a}-W¹-Z^{2b}-, wherein Z^{2a} and Z^{2b} are each O, S(O)_m (wherein m is 0, 1 or 2), an imino group which may be substituted, or a bond, and W¹ is an

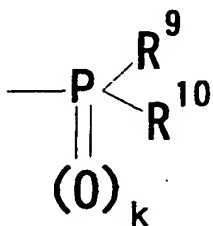
- 15 alkylene chain which may be substituted, an alkenylene chain which may be substituted, or a bond;

- X is N or CR, wherein R represents a hydrogen atom, a lower alkyl group which may be substituted, a lower alkoxy group which may be substituted or an acyl group which may be substituted, or R and the adjacent R⁴ may form a 5- or 6-
- 20

membered alicyclic heterocyclic group;

R^4 is NR^5R^6 , wherein R^5 and R^6 each represent a hydrogen atom, a hydrocarbon group which may be substituted, a heterocyclic group which may be substituted or an acyl group which may be substituted, or R^5 and R^6 are bonded to each other to form a heterocyclic group which may be substituted represented by NR^5R^6 ; and

R^2 is (1) an amino group which may be substituted, in which the nitrogen atom may be converted to a quaternary ammonium or an oxide, (2) a nitrogen-containing heterocyclic group which may be substituted and may contain a sulfur atom or an oxygen atom as the ring-constituting atom, in which the nitrogen atom may be converted to a quaternary ammonium or an oxide, (3) a group represented by the formula:



wherein k represents 0 or 1, and when k is 0, the phosphorus atom may form a phosphonium salt; R^9 and R^{10} are each a hydrocarbon group which may be substituted, a hydroxy group which may be substituted or an amino group which may be substituted; or R^9 and R^{10} may be bonded to each other to form a cyclic group with the adjacent phosphorus atom, (4)

an amidino group which may be substituted, or (5) a guanidino group which may be substituted; or a salt thereof.

5 2. A prodrug of the compound according to claim 1.

 3. The compound according to claim 1, wherein R^1 is a benzene, a furan, a thiophene, a pyridine, a cyclopentane, a cyclohexane, a pyrrolidine, a piperidine, a piperazine, a
10 morpholine, a thiomorpholine or a tetrahydropyran, each of which may be substituted.

 4. The compound according to claim 1, wherein R^1 is a benzene which may be substituted.

15

 5. The compound according to claim 1, wherein NR^5R^6 is a heterocyclic group which may be substituted.

 6. The compound according to claim 1, wherein Z^1 is a
20 benzene which may be substituted with a substituent selected from (1) a halogen atom, (2) a C_{1-4} alkyl group which may be substituted with a halogen atom, and (3) a C_{1-4} alkoxy group which may be substituted with a halogen atom.

25 7. The compound according to claim 1, wherein Z^1 is a

benzene which may be substituted with a methyl group or a trifluoromethyl group.

8. The compound according to claim 1, wherein Z^2 is a group represented by $-Z^{2a}-W^2-Z^{2b}-$, wherein Z^{2a} and Z^{2b} are each O, $S(O)_m$ (wherein m is 0, 1 or 2), an imino group which may be substituted, or a bond, and W^2 is an alkylene chain which may be substituted.

9. The compound according to claim 1, wherein Z^2 is a group represented by $-CH_2-$, $-CH(OH)-$ or $-S(O)_m-CH_2-$ (wherein m is 0, 1 or 2).

10. The compound according to claim 1, wherein Z^2 is a group represented by $-S(O)_m-CH_2-$ (wherein m is 0, 1 or 2).

11. The compound according to claim 1, wherein R^2 is (1) an amino group which may be substituted, in which the nitrogen atom may be converted to a quaternary ammonium or an oxide, (2) a nitrogen-containing heterocyclic group which may be substituted and may contain a sulfur atom or an oxygen atom as the ring-constituting atom, in which the nitrogen atom may be converted to a quaternary ammonium or an oxide, (3) an amidino group which may be substituted, or (4) a guanidino group which may be substituted.

12. The compound according to claim 1, wherein R^2 is an amino group which may be substituted, or a nitrogen-containing heterocyclic group which may be substituted and
5 may contain a sulfur atom or an oxygen atom as the ring-constituting atom.

13. The compound according to claim 1, wherein R^2 is -NRR', wherein R and R' are each an aliphatic hydrocarbon
10 group which may be substituted or an alicyclic heterocyclic group which may be substituted.

14. The compound according to claim 1, wherein R^2 is a nitrogen-containing aromatic heterocyclic group which may be
15 substituted.

15. The compound according to claim 1, wherein R^2 is an imidazolyl group which may be substituted or a triazolyl
group which may be substituted.
20

16. The compound according to claim 1, wherein R^1 is a benzene, a furan, a thiophene, a pyridine, a cyclopentane, a cyclohexane, a pyrrolidine, a piperidine, a piperazine, a morpholine, a thiomorpholine or a tetrahydropyran, each of
25 which may be substituted with a halogen, a nitro, a cyano, a

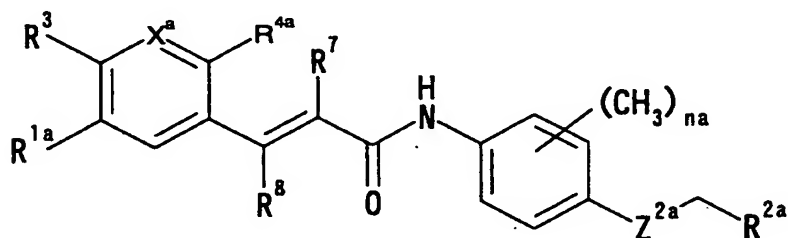
C₁₋₆ alkyl, a C₁₋₆ alkoxy, a C₁₋₆ alkoxy-C₁₋₆ alkyl or a C₁₋₆ alkoxy-C₁₋₆ alkoxy;

Z¹ is benzene which may be substituted with a substituent selected from (1) a halogen atom, (2) a C₁₋₄ alkyl group which may be substituted with a halogen atom, and (3) a C₁₋₄ alkoxy group which may be substituted with a halogen atom;

Z² is -Z^{2a}-W¹-Z^{2b}-, wherein Z^{2a} and Z^{2b} are each O, S(O)_m (wherein m is 0, 1 or 2), an imino group which may be substituted with a C₁₋₄ alkyl group, or a bond, and W¹ is a bond, or a C₁₋₄ alkylene chain or a C₂₋₄ alkenylene chain, each of which may be substituted with a C₁₋₆ alkyl, a hydroxy group, a hydroxyimino or a C₁₋₆ alkoxyimino; and

R² is an amino group which may be substituted with a C₁₋₄ alkyl group, or a nitrogen-containing heterocyclic group which may contain a sulfur atom or an oxygen atom as the ring-constituting atom and may be substituted with a C₁₋₄ alkyl group.

17. A compound represented by the formula:



wherein R^{1a} is a (C₁₋₆ alkoxy-C₁₋₆ alkoxy)phenyl;

R^{2a} is (1) an N-C₁₋₆ alkyl-N-tetrahydropyranylamino, (2) an imidazolyl which may be substituted with C₁₋₆ alkyl which may be substituted, or (3) a triazolyl which may be

5 substituted with a C₁₋₆ alkyl which may be substituted;

R^3 is a hydrogen atom, a lower alkyl group which may be substituted or a lower alkoxy group which may be substituted;

R^{4a} is $NR^{5a}R^{6a}$, wherein R^{5a} and R^{6a} are bonded to each other to form a heterocyclic group which may be substituted represented by $NR^{5a}R^{6a}$;

X^a is CH or N;

n_a is 0 or 1; and

Z^{2a} is a bond, S, SO or SO₂;

15 or a salt thereof.

18. The compound according to claim 17, wherein Z^{2a} is SO.

20 19. The compound according to claim 18, wherein Z^{2a} is SO having a configuration of (S).

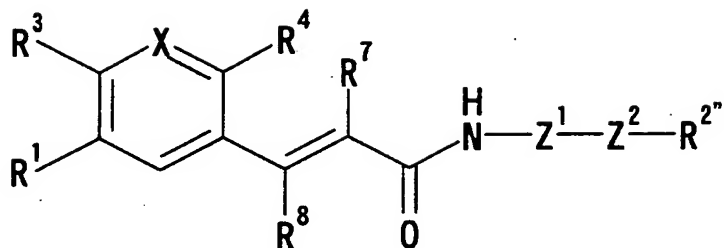
20. The compound according to claim 17, wherein R^{4a} is a 1-pyrrolidinyl group which may be substituted.

21. (Ss)-(2E)-3-[4'-(2-butoxyethoxy)-4-(3-methylpyrrolidin-1-yl)-1,1'-biphenyl-3-yl]-2-methyl-N-[4-
[[(1-propyl-1H-imidazol-5-yl)methyl]sulfinyl]phenyl]acrylamide, (Ss)-(2E)-3-[4'-(2-
5 butoxyethoxy)-4-[3-(hydroxymethyl)pyrrolidin-1-yl]-1,1'-
biphenyl-3-yl]-2-methyl-N-[4-[[(1-propyl-1H-imidazol-5-yl)methyl]sulfinyl]phenyl]acrylamide, (Ss)-(2E)-3-[4'-(2-
butoxyethoxy)-4-(3-carboxypyrrolidin-1-yl)-1,1'-biphenyl-3-yl]-2-methyl-N-[4-[[(1-propyl-1H-imidazol)-5-
10 yl)methyl]sulfinyl]phenyl]acrylamide and diastereomers thereof.

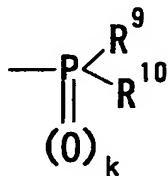
22. (Ss)-(2E)-3-[5-[4-(2-butoxyethoxy)phenyl]-2-[3-(hydroxymethyl)pyrrolidin-1-yl]pyridin-3-yl]-2-methyl-N-[4-
15 [[(1-propyl-1H-imidazol-5-yl)methyl]sulfinyl]phenyl]acrylamide and a diastereomer thereof, and (S)-(2E)-3-[5-[4-(2-butoxyethoxy)phenyl]-2-pyrrolidin-1-ylpyridin-3-yl]-2-methyl-N-[4-[[(1-propyl-1H-imidzol-5-yl)methyl]sulfinyl]phenyl]acrylamide.

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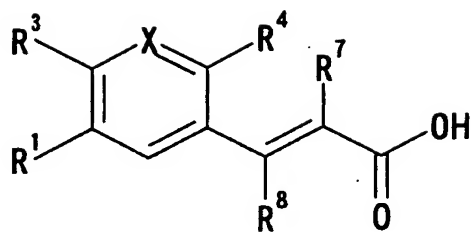
23. A process for producing a compound represented by the formula:



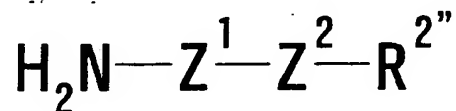
wherein $\text{R}^{2'}$ is (1) an amino group which may be substituted, in which the nitrogen atom may be converted to a quaternary ammonium, (2) a nitrogen-containing heterocyclic group which may be substituted and may contain a sulfur atom or an oxygen atom as the ring-constituting atom, in which the nitrogen atom may be converted to a quaternary ammonium, or (3) a group represented by formula:



wherein k represents 0 or 1, and when k is 0, the phosphorus atom may form a phosphonium salt; R^9 and R^{10} are each a hydrocarbon group which may be substituted, a hydroxy group which may be substituted or an amino group which may be substituted; or R^5 and R^6 may be bonded to each other to form a cyclic group with the adjacent phosphorus atom; and the other symbols have the same meanings as defined in claim 1; or a salt thereof, which comprises subjecting a compound represented by the formula:



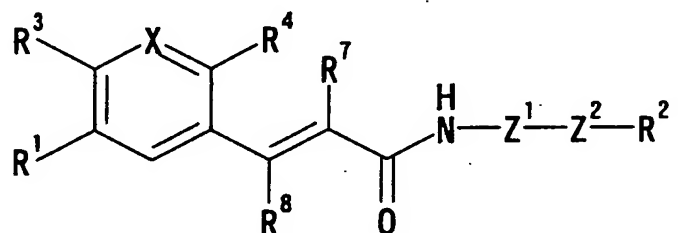
wherein each symbol has the same meaning as defined in claim 1;
 or a salt thereof or a reactive derivative thereof, and a compound represented by the formula:



- 5 wherein Z^1 and Z^2 have the same meaning as defined in claim 1, and $\text{R}^{2''}$ has the same meaning as defined above;
 or a salt thereof to a condensation reaction, and then optionally to deprotection, oxidation-reduction and/or quaternization reaction.

10

24. A pharmaceutical composition comprising the compound represented by the formula:



wherein R^1 is a 5- or 6-membered ring which may be

substituted;

R^3 is a hydrogen atom, a lower alkyl group which may be substituted or a lower alkoxy group which may be substituted;

5 R^7 and R^8 are each a hydrogen atom or a lower alkyl group which may be substituted;

Z^1 is a 5- or 6-membered aromatic ring which may be further substituted;

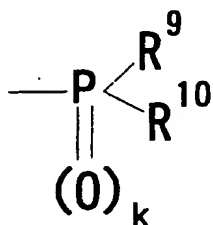
10 Z^2 is a group represented by $-Z^{2a}-W^1-Z^{2b}-$, wherein Z^{2a} and Z^{2b} are each O, S(O)_m (wherein m is 0, 1 or 2), an imino group which may be substituted, or a bond, and W^1 is an alkylene chain which may be substituted, an alkenylene chain which may be substituted, or a bond;

15 X is N or CR, wherein R represents a hydrogen atom, a lower alkyl group which may be substituted, a lower alkoxy group which may be substituted or an acyl group which may be substituted, or R and the adjacent R^4 may form a 5- or 6-membered alicyclic heterocyclic group;

20 R^4 is NR^5R^6 , wherein R^5 and R^6 each represent a hydrogen atom, a hydrocarbon group which may be substituted, a heterocyclic group which may be substituted or an acyl group which may be substituted, or R^5 and R^6 are bonded to each other to form a heterocyclic group which may be substituted represented by NR^5R^6 ; and

25 R^2 is (1) an amino group which may be substituted, in

which the nitrogen atom may be converted to a quaternary ammonium or an oxide, (2) a nitrogen-containing heterocyclic group which may be substituted and may contain a sulfur atom or an oxygen atom as the ring-constituting atom, in which
5 the nitrogen atom may be converted to a quaternary ammonium or an oxide, (3) a group represented by the formula:



wherein k represents 0 or 1, and when k is 0, the phosphorus atom may form a phosphonium salt; R⁹ and R¹⁰ are each a hydrocarbon group which may be substituted, a hydroxy group
10 which may be substituted or an amino group which may be substituted; or R⁹ and R¹⁰ may be bonded to each other to form a cyclic group with the adjacent phosphorus atom, (4) an amidino group which may be substituted, or (5) a
15 or a salt thereof or a prodrug thereof.

25. The pharmaceutical composition according to claim 24, which is a CCR antagonist.

20 26. The pharmaceutical composition according to claim

25, wherein CCR is CCR5 and/or CCR2.

27. The pharmaceutical composition according to claim 25, wherein CCR is CCR5.

5

28. The pharmaceutical composition according to claim 24, which is a prophylactic and/or therapeutic agent for HIV infection, chronic rheumatoid arthritis, autoimmune diseases, allergic diseases, ischemic brain cell disorder, cardiac
10 infarction, nephritis/nephropathy, arteriosclerosis or graft-versus-host diseases.

29. The pharmaceutical composition according to claim 24, which is a prophylactic and/or therapeutic agent for HIV
15 infection.

30. The pharmaceutical composition according to claim 24, which is a prophylactic and/or therapeutic agent for
AIDS.
20

31. The pharmaceutical composition according to claim 24, which is a suppressive agent for disease progression of
AIDS.

25 32. A method for preventing or treating HIV infection,

chronic rheumatoid arthritis, autoimmune diseases, allergic diseases, ischemic brain cell disorder, cardiac infarction, nephritis/nephropathy, arteriosclerosis or graft-versus-host diseases, which comprises administering an effective amount
5 of the compound according to claim 1, a salt or prodrug thereof to a subject in need thereof.

33. Use of the compound according to claim 1, a salt or prodrug thereof, for the manufacture of a prophylactic
10 and/or therapeutic agent for HIV infection, chronic rheumatoid arthritis, autoimmune diseases, allergic diseases, ischemic brain cell disorder, cardiac infarction, nephritis/nephropathy, arteriosclerosis or graft-versus-host diseases.